

WHAT IS CLAIMED IS:

1. An image reading apparatus which reads an image from a document placed on a document glass, in multiple colors or monochromatically, the apparatus comprising:

a photoelectric converting unit composed of a color line sensor and a monochromatic line sensor;

a scanning section in which an optical system guiding light from the document on the document glass to the photoelectric converting unit is mounted;

a driving mechanism which moves the scanning section in a sub-scanning direction relative to the document on the document glass; and

a control section which uses the color line sensor to start loading image data if the image is read, in multiple colors, from the document placed on the document glass and when a scan position of the scanning section moved by the driving mechanism in the sub-scanning direction reaches a color read start position, and which uses the monochromatic line sensor to start loading image data if the image is read monochromatically from the document placed on the document glass and when the scan position of the scanning section moved by the driving mechanism in the sub-scanning direction reaches a monochromatic read start position different from the color read start position.

2. The image reading apparatus according to

claim 1, wherein the color read start position is  
determined on the basis of a relationship between the  
scan position of the scanning section and a position of  
the color line sensor with respect to the document  
5 glass, and

the monochromatic read start position is  
determined on the basis of a relationship between the  
scan position of the scanning section and a position of  
the monochromatic line sensor with respect to the  
10 document glass.

3. The image reading apparatus according to  
claim 1, wherein if the image is read, in multiple  
colors, from the document placed on the document glass,  
the control section loads data from the color line  
15 sensor after the scan position of the scanning section  
moved by the driving mechanism in the sub-scanning  
direction has reached the color read start position and  
before a color read end position is reached which is  
based on the color read start position and a size of  
20 the document in the sub-scanning direction, and

if the image is monochromatically read from the  
document placed on the document glass, the control  
section loads data from the monochromatic line sensor  
after the scan position of the scanning section moved  
25 by the driving mechanism in the sub-scanning direction  
has reached the monochromatic read start position  
different from the color read start position and before

a monochromatic read end position is reached which is based on the monochromatic read start position and a size of the document in the sub-scanning direction.

4. The image reading apparatus according to  
5 claim 1, wherein the driving mechanism is composed of a stepping motor which is driven in response to a driving clock provided by the control section, and

if the image is read, in multiple colors, from the document placed on the document glass, the control  
10 section starts loading data from the color line sensor when the driving mechanism causes the scanning section to move a distance corresponding to a color read start clock, and

if the image is monochromatically read from the document placed on the document glass, the control  
15 section starts loading data from the monochromatic line sensor when the driving mechanism causes the scanning section to move a distance corresponding to a monochromatic read start clock different from the color  
20 read start clock.

5. The image reading apparatus according to claim 4, wherein the color read start clock is determined on the basis of a speed at which the scanning section moves and a distance from a position  
25 where the scanning section starts to move to the color read start position, and

the monochromatic read start clock is determined

on the basis of the speed at which the scanning section moves and a distance from the position where the scanning section starts to move to the monochromatic read start position.

5           6. The image reading apparatus according to claim 1, wherein in the photoelectric converting unit, the color line sensor and the monochromatic line sensor are arranged in the sub-scanning direction with a predetermined distance between them, and

10           if the image is read, in multiple colors, from the document placed on the document glass, the control section starts loading data from the color line sensor when the scanning section moved by the driving mechanism in the sub-scanning direction reaches a  
15           predetermined read start position, and

            if the image is monochromatically read from the document placed on the document glass, the control section starts loading data from the monochromatic line sensors when the scanning section moved by the driving  
20           mechanism in the sub-scanning direction moves a distance equal to the distance between the color line sensor and the monochromatic line sensor, from the predetermined read start position.

            7. An image reading apparatus which reads  
25           an image from a document in multiple colors or monochromatically, the apparatus comprising:

            a document feeding section that conveys the

document placed on a document feeding table;

a photoelectric converting unit composed of a color line sensor and a monochromatic line sensor;

5 a scanning section in which an optical system guiding light from the document conveyed by the document feeding section to the photoelectric converting unit is mounted;

a driving mechanism which moves the scanning section; and

10 a control section which uses the driving mechanism to move the scanning section from a predetermined standby position to a color read position if the image is read from the document conveyed by the document feeding section in a color read mode in which the color  
15 line sensor reads the image, the control section using the driving mechanism to move the scanning section from the predetermined standby position to a monochromatic read position if the image is read from the document conveyed by the document feeding section in a mono-  
20 chromatic read mode in which the monochromatic line sensor reads the image.

8. The image reading apparatus according to claim 7, wherein the color read position is set by aligning a central position of the scan position of the  
25 color line sensor with a focused position, and

the monochromatic read position is set by aligning a central position of the scan position of the

monochromatic line sensor with the focused position.

9. The image reading apparatus according to claim 7, further comprising a memory which stores a first coordinate indicative of a distance from the standby position of the scanning section to the color read position and a second coordinate indicative of a distance from the standby position of the scanning section to the monochromatic read position, and

if the image is read from the document conveyed by the document feeding section, in the color read mode, the control section reads the first coordinate stored in the memory and then causes the driving mechanism to move the scanning section a distance equal to the first coordinate from the standby position, and then the scanning section reads, in multiple colors, the image from a read surface of the document conveyed by the document feeding section, and

if the image is monochromatically read from the document conveyed by the document feeding section, the control section reads the second coordinate stored in the memory and then causes the driving mechanism to move the scanning section a distance equal to the second coordinate from the standby position, and then the scanning section monochromatically reads the image from the read surface of the document conveyed by the document feeding section.

10. The image reading apparatus according to

claim 7, wherein the color line sensor is composed of a plurality of line sensors, and

the color read position is set so that at the scan position of each of the line sensors constituting the color line sensor, a focal depth to the read surface of the document conveyed by the document feeding section is within a permissible range.

11. The image reading apparatus according to claim 7, wherein the color line sensor is composed of a plurality of line sensors, and

the color read position is set so that at the scan position of each of the line sensors constituting the color line sensor, a focal depth to the read surface of the document conveyed by the document feeding section is smallest.

12. The image reading apparatus according to claim 7, wherein the photoelectric converting unit is composed three line sensors for three primary colors arranged at predetermined intervals and a black and white line sensor,

the color read position is where a scan position of a central one of the three line sensors for the three primary colors coincides with the focused position, and

the monochromatic read position is where a scan position of the black and white line sensor coincides with the focused position.

13. An image reading apparatus which reads an image from a document in multiple colors or monochromatically, the apparatus comprising:

5 a document feeding section that conveys the document placed on a document feeding table;

a photoelectric converting unit composed of a color line sensor and a monochromatic line sensor;

10 a scanning section in which an optical system guiding light from a read surface of the document conveyed from the document feeding section to each line sensor of the photoelectric converting unit is mounted;

a driving mechanism which moves the scanning section; and

15 a control section which uses the driving mechanism to move the scanning section from a predetermined standby position to a read position set on the basis of a location of each line sensor with respect to the read surface of the document conveyed by the document feeding section as well as a sensitivity of each line  
20 sensor if the image is read from the document conveyed by the document feeding section, in multiple colors or monochromatically.

14. The image reading apparatus according to claim 13, wherein the read position is set so that all  
25 the line sensors constituting the photoelectric converting unit are positioned at or below the focal depth from the read surface of the document conveyed by



the document feeding section and so that one of the plurality of line sensors which has the lowest sensitivity is located closest to the focused position.

15        15. The image reading apparatus according to claim 14, wherein the read position is further set so that the plurality of line sensors constituting the photoelectric converting unit other than the one having the lowest sensitivity are arranged successively further from the focused position in order of  
10        increasing sensitivity.

15        16. The image reading apparatus according to claim 13, wherein the photoelectric converting unit is composed of a monochromatic line sensor having the highest sensitivity and a first, second, and line  
15        sensor the sensitivity of which increases in this order, and scan positions of the line sensors are arranged in order of the monochromatic line sensor, the third line sensor, the second line sensor, and the first line sensor relative to a direction in which the  
20        document feeding section conveys the document, and

20        the read position is set so that the scan position of the third line sensor coincides with the focused position with respect to the read surface of the document conveyed by the document feeding section.

25        17. The image reading apparatus according to claim 16, wherein the first line sensor is a red line sensor which photoelectrically converts a red component

of incident light, the second line sensor is a green line sensor which photoelectrically converts a green component of incident light, and the third line sensor is a blue line sensor which photoelectrically converts a blue component of incident light, and

the read position is set so that the scan position of the blue line sensor coincides with the focused position with respect to the read surface of the document conveyed by the document feeding section.

18. A method of reading an image from a document placed on a document glass, in multiple colors or monochromatically, the method comprising:

causing a driving mechanism to move a scanning section in a sub-scanning direction relative to the document on the document glass, an optical system being mounted in the scanning section and guiding light from the document on the document glass to a photoelectric converting unit composed of a color line sensor and a monochromatic line sensor;

if the image is read, in multiple colors, from the document placed on the document glass, using the color line sensor to start loading image data when a scan position of the scanning section moved by the driving mechanism in the sub-scanning direction reaches a color read start position; and

if the image is read monochromatically from the document placed on the document glass, using the

monochromatic line sensor to start loading image data  
when the scan position of the scanning section moved by  
the driving mechanism in the sub-scanning direction  
reaches a monochromatic read start position different  
5 from the color read start position.

19. The image reading method according to  
claim 18, wherein the color read start position is  
determined on the basis of a relationship between the  
scan position of the scanning section and a position of  
10 the color line sensor with respect to the document  
glass, and

the monochromatic read start position is  
determined on the basis of a relationship between the  
scan position of the scanning section and a position of  
15 the monochromatic line sensor with respect to the  
document glass.

20. The image reading apparatus according to  
claim 18, wherein if the image is read, in multiple  
colors, from the document placed on the document glass,  
20 data is loaded from the color line sensor after the  
scan position of the scanning section moved by the  
driving mechanism in the sub-scanning direction has  
reached the color read start position and before a  
color read end position is reached which is based on  
25 the color read start position and a size of the  
document in the sub-scanning direction, and

if the image is monochromatically read from the

document placed on the document glass, data is loaded from the monochromatic line sensor after the scan position of the scanning section moved by the driving mechanism in the sub-scanning direction has reached the monochromatic read start position different from the color read start position and before a monochromatic read end position is reached which is based on the monochromatic read start position and a size of the document in the sub-scanning direction.

21. The image reading method according to claim 18, wherein the driving mechanism is composed of a stepping motor which is driven in response to a driving clock provided by the control section, and

if the image is read, in multiple colors, from the document placed on the document glass, data starts to be loaded from the color line sensor when the driving mechanism causes the scanning section to move a distance corresponding to a color read start clock, and

if the image is monochromatically read from the document placed on the document glass, data starts to be loaded from the monochromatic line sensor when the driving mechanism causes the scanning section to move a distance corresponding to a monochromatic read start clock different from the color read start clock.

22. The image reading method according to claim 21, wherein the color read start clock is determined on the basis of a speed at which the

scanning section moves and a distance from a position where the scanning section starts to move to the color read start position, and

the monochromatic read start clock is determined  
5 on the basis of the speed at which the scanning section moves and a distance from the position where the scanning section starts to move to the monochromatic read start position.

23. The image reading method according to  
10 claim 18, wherein in the photoelectric converting unit, the color line sensor and the monochromatic line sensor are arranged in the sub-scanning direction with a predetermined distance between them, and

if the image is read, in multiple colors, from the  
15 document placed on the document glass, data starts to be loaded from the color line sensor when the scanning section moved by the driving mechanism in the sub-scanning direction reaches a predetermined read start position, and

20 if the image is monochromatically read from the document placed on the document glass, data starts to be loaded from the monochromatic line sensors when the scanning section moved by the driving mechanism in the sub-scanning direction moves a distance equal to the  
25 distance between the color line sensor and the monochromatic line sensor, from the predetermined read start position.

24. An image reading method used for an image reading apparatus having a document feeding section that conveys the document placed on a document feeding table, a photoelectric converting unit composed of a plurality of line sensors, a scanning section in which an optical system guiding light from the document conveyed by the document feeding section to the photoelectric converting unit is mounted, and a driving mechanism which moves the scanning section, the method comprising:

if the image is read from the document conveyed by the document feeding section in a color read mode, using the driving mechanism to move the scanning section from a predetermined standby position to a color read position and then reading the image from the document using the color line sensor included in the plurality of the line sensors constituting the photoelectric converting unit;

if the image is read from the document conveyed by the document feeding section in a monochromatic read mode, using the driving mechanism to move the scanning section from the predetermined standby position to a monochromatic read position and then reading the image from the document using the monochromatic line sensor included in the plurality of the line sensors constituting the photoelectric converting unit.

25. The image reading method according to

claim 24, wherein the color read position is set by aligning a central position of the scan position of the color line sensor with a focused position, and

5 the monochromatic read position is set by aligning a central position of the scan position of the monochromatic line sensor with the focused position.

26. The image reading method according to claim 24, wherein the image reading apparatus has a memory which stores a first coordinate indicative of a distance from the standby position of the scanning section to the color read position and a second coordinate indicative of a distance from the standby position of the scanning section to the monochromatic read position, and

15 if the image is read from the document conveyed by the document feeding section, in the color read mode, the first coordinate stored in the memory is read, then the driving mechanism is caused to move the scanning section a distance equal to the first coordinate from the standby position, and subsequently the image is read, in multiple colors, from a read surface of the document conveyed by the document feeding section, and

20 if the image is monochromatically read from the document conveyed by the document feeding section, the second coordinate stored in the memory is read, then the driving mechanism is caused to move the scanning section a distance equal to the second coordinate from

the standby position, and subsequently the image is monochromatically read from the read surface of the document conveyed by the document feeding section.

27. The image reading method according to  
5 claim 24, wherein the color line sensor is composed of a plurality of line sensors, and

the color read position is set so that at the scan position of each of the line sensors constituting the color line sensor, a focal depth to the read surface of  
10 the document conveyed by the document feeding section is within a permissible range.

28. The image reading method according to claim 24, wherein the color line sensor is composed of a plurality of line sensors, and

15 the color read position is set so that at the scan position of each of the line sensors constituting the color line sensor, a focal depth to the read surface of the document conveyed by the document feeding section is smallest.

20 29. The image reading method according to claim 24, wherein the photoelectric converting unit is composed three line sensors for three primary colors arranged at predetermined intervals and a black and white line sensor,

25 the color read position is where a scan position of a central one of the three line sensors for the three primary colors coincides with the focused



position, and

the monochromatic read position is where a scan position of the black and white line sensor coincides with the focused position.

5           30. An image reading method used for an image reading apparatus having a document feeding section that conveys the document placed on a document feeding table, a photoelectric converting unit composed of a plurality of line sensors, a scanning section in which  
10           an optical system guiding light from the document conveyed by the document feeding section to each line sensor of the photoelectric converting unit is mounted, and a driving mechanism which moves the scanning section, the method comprising:  
15           if the image is read from the document conveyed by the document feeding section, in multiple colors or monochromatically, the driving mechanism is used to move the scanning section from a predetermined standby position to a read position set on the basis of a  
20           location of each line sensor with respect to the read surface of the document conveyed by the document feeding section as well as a sensitivity of each line sensor, and then the image is read from the document using the color line sensor or monochromatic line  
25           sensor included in the plurality of line sensors constituting the photoelectric converting unit.

31. The image reading method according to

claim 30, wherein the read position is set so that all the line sensors constituting the photoelectric converting unit are positioned at or below the focal depth from the read surface of the document conveyed by the document feeding section and so that one of the plurality of line sensors which has the lowest sensitivity is located closest to the focused position.

32. The image reading method according to claim 30, wherein the read position is further set so that the plurality of line sensors constituting the photoelectric converting unit other than the one having the lowest sensitivity are arranged successively further from the focused position in order of increasing sensitivity.

33. The image reading method according to claim 30, wherein the photoelectric converting unit is composed of a monochromatic line sensor having the highest sensitivity and a first, second, and line sensor the sensitivity of which increases in this order, and scan positions of the line sensors are arranged in order of the monochromatic line sensor, the third line sensor, the second line sensor, and the first line sensor relative to a direction in which the document feeding section conveys the document, and the read position is set so that the scan position of the third line sensor coincides with the focused position with respect to the read surface of the

document conveyed by the document feeding section.

34. The image reading method according to  
claim 33, wherein the first line sensor is a red line  
sensor which photoelectrically converts a red component  
of incident light, the second line sensor is a green  
line sensor which photoelectrically converts a green  
component of incident light, and the third line sensor  
is a blue line sensor which photoelectrically converts  
a blue component of incident light, and

the read position is set so that the scan position  
of the blue line sensor coincides with the focused  
position with respect to the read surface of the  
document conveyed by the document feeding section.